

Survey of Mentoring Experiences of NIH Postdoctoral Fellows

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For the last half-century postdoctoral training has boosted the success of US science by promoting the early development of a scientist into an independent researcher (1). However, in the past decade, the growing trend has been for postdoctoral fellows to undergo multiple postdoctoral training experiences prior to securing permanent positions. This has resulted in a population of highly trained scientists who are still in training, and thereby receiving low salaries with no benefits such as retirement, until their late thirties. Recent studies have shown that the percentage of new R01 grantees below the age of 35 has dropped to 5%, with the average age for this population being approximately 38 (2). Thus the issue of effectively training postdoctoral fellows to become young investigators is at question. Despite a common belief that good mentoring can enhance this process, only limited data define the characteristics of satisfactory supervisor-trainee relationships (3) until now.

The National Institutes of Health (NIH) leadership wanted to assess the quality of the mentoring in its Intramural Research Programs, which include over 3000 fellows. In 1998, the Mentoring Subcommittee of the NIH Fellows Committee (FelCom) conducted a web-based survey, but the 20% response rate precluded any clear conclusions. The Deputy Director for Intramural Research (DDIR) and the Scientific Directors (SDs) encouraged FelCom to identify key components of good mentoring and areas of concern that could be addressed through a redesigned survey to be conducted in the summer of 2001, with emphasis on issues raised in the publication “A Guide to Training and Mentoring in the Intramural Research Program at the NIH” (4).

Several steps were taken to improve participation (5). An outside company was hired to conduct the survey in order to allay concerns about confidentiality among

potential respondents. Instead of surveying all fellows, a representative sample was contacted, with the remaining financial resources allocated for improving the response rate. FedEx delivered the surveys, and reminder e-mails were sent by the company to non-respondents. An incentive was offered to the first 10% of respondents. The total cost for the contract was \$12,715.

The survey (4), consisting of 28 questions, asked the fellows to consider the supervisor who provides *scientific* and *career* guidance as their mentor. The survey addressed concerns in six major areas: mentor relations, scientific direction and independence, supervisor accessibility and availability, trainee recognition, training and career development, and overall mentoring satisfaction/quality. Some of the findings are presented in the text box; more details are posted on the web page (4).

A random sample of 750, stratified by institute, was drawn from the 3,051 fellows who had been in specified postdoctoral positions (see Table 1) at the NIH for 0.5-5 years. To obtain useful institute-specific information, we over-sampled fellows in the smaller institutes. The sampling fractions varied from 11% to 51% for the 21 NIH institutes, plus the Center for Biological Evaluation and Review/ Food and Drug Administration (located on the NIH Bethesda campus). Response rates ranged from 50% to 88% across the institutes. Five hundred thirty nine of the 750 fellows sampled (72%) responded to the survey. Demographics of the respondents are shown in Table 1.

The statistical analysis was weighted so that the results would not be distorted by the varying sampling fractions and response rates in the different institutes. Regression analyses were used to evaluate the fellows' perspective of *training* and *career* goals

being met, and overall quality of mentoring (4). SAS version 8.2 and SUDAAN version 8.0 were used for the analyses (6, 7). All statistical tests were two-sided.

The results of the survey suggest that three key factors define the fellowship experience: achievement of *training goals*, achievement of *career goals*, and overall quality of mentoring. Sixty percent had discussed both *training* and *career* goals with supervisors. Seventy one percent reported that their *training* goals were “mostly” or “fully met,” whereas 61% reported that their *career* goals were “mostly” or “fully met” (Fig. 1). Fellows were asked to rate the quality of mentoring that they received and to assess any change in the quality of that mentoring over the course of their fellowship. Most trainees reported that the mentoring received was “good” or “excellent” (72%), with 12% indicating that the mentoring received was “poor” (Fig. 1). The majority also felt that the quality of mentoring had either improved (32%) or stayed the same (61%) during their time at NIH, with 6% reporting that it had worsened.

Responses to other survey questions allowed identification of predictors of these three factors. Figure 2A-C displays the proportion of fellows within each category of these predictors who reported their *training* and *career* goals as being “mostly or fully” met, and their quality of mentoring as being “good or excellent”. Figure 2A shows that fellows who reported “too little” scientific direction given by the mentor, “too much” independence in their research, and total lack of feedback from the mentor when research was stalled were less likely to perceive that their *training goals* were being met. Figure 2B shows that fellows who reported “too much” or “too little” independence in research, total lack of feedback from mentor when research was stalled, only rare recognition for work in publications and presentations, never being introduced to scientists outside their

laboratory/branch by their mentor, and no discussion of *career* goals with the mentor as being less likely to report their *career goals* met. Figure 2C shows that fellows perceived mentoring to be “good/excellent” if they received scientific mentoring, career mentoring, just the right amount of scientific direction from mentor, just the right amount of independence in research, very useful feedback from mentor whether research was going well or not, appropriate recognition for work in publications and presentations, and had discussed *career* goals with mentor. These predictors thus define a set of characteristics important to a good mentoring experience.

The results do not support our original predictions about some of the factors that would be important. Contrary to expectations, the institute size and the number of postdoctoral fellows working with a single mentor were not significant predictors of the three factors, namely *training goals met*, *career goals met*, and *overall quality of mentoring*. The other surprising finding was that fellows who reported “too much” independence in their research project were less likely to perceive their *training goals* as being met. Other results (text box) showed surprising differences among subgroups of fellows.

A recent *Science* News and Notes (8) addresses whether a postdoctoral position is primarily for training or whether sufficient work is involved for the position to qualify as a job (which would thereby entitle fellows to the ensuing benefits). The NIH distinguishes between a postdoctoral training position (IRTA/CRTA/VF) and a senior fellow (Research/Clinical Fellow). A postdoctoral fellow is a doctoral-level scientist in the beginning stages of his/her professional research career who participates in biomedical research for the purpose of obtaining advanced training and practical research

experience under the direction of a Principal Investigator. Training awards are limited to five years. A Research/Clinical Fellowship provides junior-level scientists experience in biomedical research while they carry out work relevant to the NIH's program needs: these fellows have already had several years of postdoc experience and are able to conduct successfully a pre-established program in research with minimal supervision.

Interestingly, there were no significant differences between these two groups' responses to the survey: the only difference that approached significance was that a higher percentage of Research/Clinical Fellows indicated they received too little scientific direction compared to IRTA/VFs (4). This result may indicate that these fellows, although they have job benefits, are still essentially postdoctoral fellows in need of further training.

Although NIH fellows in general were satisfied with their mentoring, several specific issues were raised that undoubtedly impact fellows everywhere. The perspectives of the mentor and the fellow on what is expected from the fellowship training might not be the same: hence communication plays a very important role, and must be the first step, in achievement of a successful training experience. This is supported by the survey results: e.g., fellows who had discussed career goals with their supervisor were almost twice as satisfied with the quality of mentoring as those who had not (Fig. 2C). Based on the results of the survey, the fellows made a series of specific recommendations to the SDs that addressed the problem of communication and the areas of concern that arise as a result of the lack of it. These recommendations have been outlined in three documents approved by the SDs entitled "Guidelines for Mentors", "Guidelines for Trainees", and "Criteria for the Yearly Progress Review". These three

documents are publicly available (4) and are meant to facilitate discussions between mentor and fellow so that the expectations of both parties have a better chance of being met.

The issues discussed above led to the recommendations in the “Guidelines for Mentors”: (i) the mentor (or a surrogate when the mentor is on travel) should be readily available to the trainee to answer questions about research and discuss results and future research directions; (ii) the mentor should work closely with the trainee in the preparation of oral presentations, papers, and abstracts describing the work; (iii) the mentor should advise the trainee about the best fora for presenting the research work, and when attending meetings together, the mentor should strive to introduce the trainee to important contributors to the research field; and (iv) the mentor should provide the trainee with an oral and written assessment of the trainee's progress, strengths, and areas requiring improvement on an annual basis. This meeting should include a discussion of the trainee's professional goals and the mentor's feedback on their appropriateness, the likely length of stay in the laboratory, and planning and preparation for career decisions after the NIH training. Another more general recommendation found in the “Guidelines for Trainees” is that fellows seek additional mentors. FelCom believes that the implementation of these recommendations will further strengthen the mentoring experiences of postdoctoral fellows at the NIH and that other institutions where fellows are being trained may wish to consider implementation of some or all of them.

One strength of this survey was the high response rate (72%), allowing the generation of a set of predictors for good mentoring relationships; this response rate is slightly higher than the rate in other published studies of similar populations (10-15:

these studies have reported response rates of 62% to 69%). This may be close to a realistic upper bound for a mail survey on a sensitive topic, given how vulnerable, busy, and transient, fellows are. The stratified random sampling design, and the weighting adjustment for stratification and non-response, made the comparisons and analyses valid and generalizable to the entire population of NIH postdoctoral fellows while allowing inferences for smaller institutes. Since only limited demographic information was collected on respondents due to confidentiality concerns, limited adjustments could be made for non-responders. However, the weighting adjustment for non-response should reduce the non-response bias compared with analyses that include only fellows with complete information; furthermore, no item had a non-response rate greater than 10%, not likely to affect the results significantly.

Limitations included: reliance on self-report and restricted use of the full range of mentoring factors. Despite these limitations, we believe that our survey provides useful information about the relationships between predictors of mentoring and quality of mentoring; assessment of levels of satisfaction may be affected by non-participation of the most satisfied or dissatisfied fellows. Although most of the variables identified by this survey as being predictive of the three main factors seem intuitive or expected, we are not aware of any other study that has reported similar findings from a formal survey.

The three key factors (*training goals being met, career goals being met, and good overall quality of mentoring*) did not differ significantly by the size of the institute where the fellow was trained, once the predictors were taken into account. This strongly suggests that the three factors are likely to hold elsewhere. Fellows at all institutions value time with their mentor and may feel that they are not getting enough career advice.

Other studies have found that career/professional development was a major factor associated with successful mentoring (3) and that graduate students receive too little career guidance (8).

Other institutions may be interested to evaluate their fellows' satisfaction with the mentoring being received, but their resources to carry out an extensive survey might be limited. The NIH survey is available on the web (4) as a basis for such efforts. The methods for increasing participation are simple to apply with limited resources and the results can be analyzed using standard survey-sampling software. The documents (4) that we present here may be used as a model for conducting similar surveys among fellows elsewhere, and provide a basis for extensive and focused discussions between mentor and fellow throughout the relationship. Our future plans are to pursue further analyses of the subgroups defined in this survey, through a follow-up survey, to address the issues that may prevent one or more of these subgroups from obtaining optimal mentoring.

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
Text Box:

Other findings that can be found on our website (4):

- 85% reported that their supervisor was always/mostly available
- BUT females met with their supervisor less than males
- AND clinical fellows met less with their supervisors than non-clinical fellows
- 86% were encouraged to present work at meetings
- 75% said their supervisors introduced them to outside scientists
- BUT fellows who had been at the NIH two years or longer were less likely to be introduced to outside scientists than fellows who had been at the NIH for less than two years
- There was no difference in mentoring based on number of fellows in the lab after accounting for gender, ethnicity, type of fellow, number of years as fellow, and size of the institute

Figure Legends

Figure 1. Proportion of fellows reporting each of the four categories for the Three Key Factors of Mentoring; Training goals met, Career goals met, and Quality of mentoring

Fully met  , Mostly met  , Partially met  , Not met at all 





Excellent  , Good  , Satisfactory  , Poor 

Figure 2. Each figure shows the percentage of fellows in each category of the positive predictive mentoring characteristics who reported their *training* goals (A) and *career* goals (B) as being mostly or fully met, and quality of mentoring (C) as being good or excellent. The mentoring predictors are indicated to the right of the graphs and the different categories within these predictors are indicated on the left. The black dots indicate the proportion of fellows within each of the categories of the predictors who also reported “mostly or fully met” *training* and *career* goals (A and B, respectively) or “good or excellent” quality of mentoring (C). For example, in (A), among all of the fellows who reported they had ‘just right’ scientific direction, 81% also reported their *training goals* were being mostly or fully met; thus each predictor is not meant to add up to 100%. Parentheses “()” indicate standard errors. The graph does not include fellows who reported their *training goals* as being “partially met or not met at all”.

Table 1: Demographic characteristics of respondents (N=539)

Variable	Number Responded¹	Percentage[*]
<i>Gender</i>		
Male	293	54.4
Female	205	38.0
<i>Ethnicity^{**}</i>		
African-American	11	3.2
Asian/Pac Islander	90	26.3
Caucasian	157	45.9
Hispanic	10	2.9
Native American	1	0.3
Other	19	5.6
<i>Type of Fellow</i>		
Clinical Fellow [‡]	45	8.3
Research Fellow [‡]	131	24.3
IRTA/CRTA [⊕]	105	19.5
Visiting Fellow	197	36.5
Other	10	1.9
<i>Degree</i>		
MD	152	28.2
Other Doctoral Degree	387	64.0
<i>Number of previous post-docs</i>		
0	301	60.7
1	140	28.2
2	34	6.9
3	9	1.8
4+	8	1.6
<i>Type of Institute</i>		
Small (<60 fellows)	91	16.9
Medium (60-200 fellows)	201	37.3
Large (>200 fellows)	195	36.2
<i>Year began fellowship</i>		
<=1996 (4-5 Yrs)	38	7.1
1997-99 (1-3 Yrs)	282	52.3
>=2000 (0.5-1 Yrs)	157	29.1

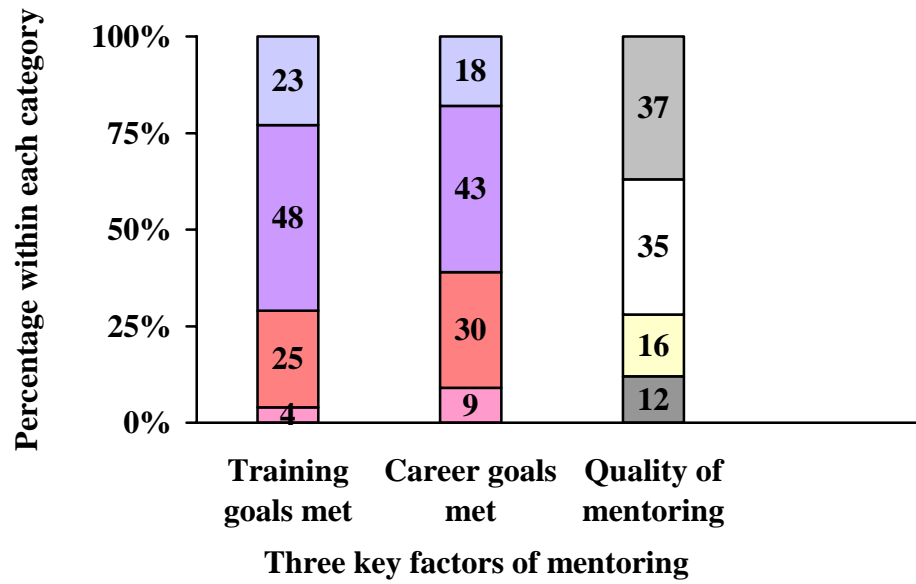
^{*} Among respondents for all variables except for Ethnicity where the Percentages are among all fellows other than Visiting Fellows.

^{**} Visiting Fellows (Fellows from countries other than USA) not included.

[‡] Clinical and Research Fellows – have done postdoctoral training and are temporary NIH employees.

[⊕] Intramural Research Training Award/Cancer Research Training Award – fellowship for American fellows.

¹ Totals do not sum up to 539 due to unknown values.



A.

Categories

Predictors of mentoring satisfaction

Too Much ()

Just Right (•)

Too Little ()

Scientific direction

Too Much ()

Just Right (•)

Too Little ()

Independence in research

Very Useful (•)

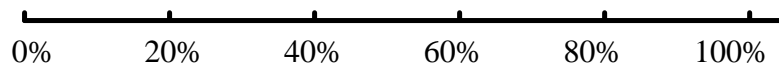
Somewhat Useful ()

Not Useful ()

Feedback when stalled

Never Gives Feedback (•)

Work Never Stalled ()



Percentage of *training* goals mostly or fully met within each category

B.

Categories

Predictors of mentoring satisfaction

Too Much (●)

Just Right (●)

Too Little (●)

Independence in research

Very useful (●)

Somewhat useful (●)

Not useful (●)

Feedback when stalled

Never gives feedback (●)

Work never stalled (●)

Yes (●)

Most of the time (●)

Seldom (●)

Recognition for work

Never (●)

Yes (●)

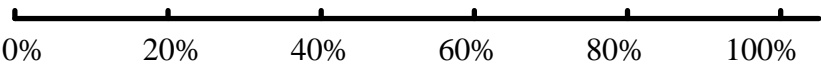
No (●)

Promotes introductions

Yes (●)

No (●)

Discuss career goals



Percentage of *career* goals mostly or fully met within each category

C.

